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ABSTRACT

ERIC abstracts on systems approaches in education, announced in RIE through January 1970, are compiled. The key terms used in compiling this collection are "systems approach," "systems analysis," "critical path method," and "systems concepts." The following information is presented for each document: author, title, place of publication, publisher, publication date, number of pages, ERIC document (ED) number, price and availability, and abstract. A subject index is cross-referenced with the document listing. (EA)

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Systems
Approaches
in Education

EA 002 816

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ERIC ABSTRACTS:

A Collection of ERIC Document Resumes on

SYSTEMS APPROACHES IN EDUCATION

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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PREFACE

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Philip K. Piele
Director

INTRODUCTION

Since the beginning of ERIC in 1966, more than 20,000 documents have been announced in ERIC's monthly catalog, Research in Education (RIE). Of this total, about 1,200 documents have been processed by this Clearinghouse. So extensive is this growing collection of documents that we thought it would be useful to compile separate lists of ERIC documents on a number of critical topics in educational administration. Published separately, these selected lists of documents comprise the ERIC Abstracts series.

To compile each list, a search is made of the RIE indexes, using key terms that define the topic being searched. The terms used to compile this collection of documents on systems approaches in education are SYSTEMS APPROACH, SYSTEMS ANALYSIS, CRITICAL PATH METHOD, and SYSTEMS CONCEPTS. Relevance to the topic is the only criterion for listing a document. The listing is complete for all issues of RIE through January 1970. Not all the listed documents were processed by this Clearinghouse.

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A subject index, beginning on page 40, is cross-referenced with the document listing. The subject terms, arranged in alphabetical order, are identical to those contained in RIE's subject index.

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1. Arnold, Mary F., and others. Health program implementation through PERT, administrative and educational uses. San Francisco: American Public Health Association, October 1966. ED 012 431 Not available from EDRS. (Available from The Continuing Education Program, Western Regional Office, American Public Health Association, 655 Sutter Street, Room 201, San Francisco, California 94102, for $2.00.)

   The main advantage of the program evaluation and review technique (PERT) is the provision of a graphic model of activities with estimates of the time, resources, personnel, and facilities necessary to accomplish a sequence of interdependent activities, as in program implementation. A PERT model can also improve communication between persons and departments by showing the precise role of each unit in the process, and can help reduce friction in problem solving and administrative decision making by revealing necessary steps. The steps in developing the network itself are specifying the final event or completion point, deciding on precedent events that must be attained, sequencing these events properly, and determining activity time between events. PERT has been sucessfully used in planning a program of dental continuing education, developing a teacher's handbook, and conducting various public health projects. However, PERT does not promote creativity or originality, and must follow the stages of problem identification, fact finding, determination of long-range and short-range goals and of criteria, and evaluation of possible solutions. The document includes a problem-solving flowchart, PERT network flow diagrams, and 21 references.

2. Banathy, Bela H. The design of foreign language teacher education. The Modern Language Journal, v. 52, n. 8, pp. 490-500, (December 1968), 11p. ED 030 336 MF $0.25 HC $0.65.

   The developmental scheme of the systems approach could be applied effectively to the design of foreign language teacher education. After the performance objectives had been formulated and the learning tasks analyzed and characterized, the design of the system could be undertaken. This would involve: (1) Functions and component analyses, (2) the selection of alternative components to accommodate group and individual differences, and (3) scheduling of functions and components in time and place. System integration could be accomplished by the processes of feedback, feedforward, and by the deliberate interrelating of subsystems and subordinating of the subsystems to the system objectives. As the system was installed and implemented, evaluation by monitoring and performance testing could constantly oversee and test the operation of the system and the adequacy of the product for improving and stabilizing, at a high professional level, the training of foreign language teachers.

3. Baum, C. Research and Technology Division report for 1966. Santa Monica: System Development Corporation, January 1967. 234p. ED 010 558 MF $1.00 HC $11.80.

The work of the Research and Technology Division of System Development Corporation during 1966 is reported. Progress is reported on the following various studies and activities: Advanced programing, information processing research, programing systems, data base systems, language processing and retrieval, behavioral gaming and simulation research education and training, mathematics and operations research, computer center department, and special service operations. In addition, the report contains descriptions of division-sponsored books, demonstration programs, meetings and colloquiums, and professional activities of the staff.

4. Boice, John. A systems approach to school construction. Speech given at the National Vocational Technical Faculty Planning conference. Reno: Department of School Administration, Nevada University. 13p. ED 025 113 MF $0.25 HC $0.75.

Systems approach as used in this paper refers to the process of a building coming into being. The systems approach attempts to relate the processes of factory production and school construction in that the problems of the spacing and fitting of construction components are considered at the beginning of the design stage of construction. For the systems approach to insure minimum cost, high quality, and flexibility, it must be based on production volume, reasonable notice time to industry for tailor-made components, and clearly defined functional goals.

5. Bratten, J.E. The organization of a biology course for individual progress at Theodore High School--descriptive analysis. Santa Monica: System Development Corporation, December 9, 1965. 21p. ED 010 566 MF $0.25 HC $1.15.

Systems analysis and computer simulation techniques were applied in describing the biology course at the Theodore High School, Theodore, Alabama, which was selected as the unit of study because of its organization of courses for individual progress. A descriptive analysis of the biology course was presented in terms of (1) instructional media, (2) procedures, (3) roles of personnel involved in the course, and (4) space used. A study guide used to direct each student through the course was another innovative feature of the course organization. The study guide consisted of a detailed plan of the course and instruction for students. The course was divided into three levels of performance:

(1) High aptitude, (2) medium aptitude, and (3) low aptitude. Student assignment, performance, and course characteristics were described.

6. Bratten, Jack E. The organization of a course for individual progress at Theodore High School--system analysis and simulation. Santa Monica: System Development Corporation, March 15, 1966. 42p. ED 010 567 MF $0.25 HC $2.20.

The biology course of Theodore High School at Theodore, Alabama, was studied as a system for "processing" students and was simulated on a computer. An experimental version of the course was simulated and compared with the actual course. The purposes of this study were (1) to examine the concept of individual progress as it related to the organization of courses in general and the biology course in particular; (2) to draw implications from the results as they related to defining new roles for school personnel, providing information on the use of media as it affects interactions of students and of students and teachers, describing new applications for data processing, providing information on amount and arrangement of space, and providing estimates of characteristics of graduating students; and (3) to draw conclusions about the use of systems analysis and computer simulation as research techniques. The use of systems analysis and simulation to study possible behaviors of an existing school organization was found to be feasible and valuable. Simulation of the operation of a theoretical organization provided predictions of the results to be expected from use of the planned organization. Data gathered from this study could be of possible value to course designers who desire a theoretical model to guide their efforts.

7. Bushnell, David S. An educational system for the 70's. Speech delivered at the Aerospace Education Foundation Conference--Washington, D.C., September 12, 1967. 22p. ED 017 738 MF $0.25 HC $1.20.

Although the United States' educational system has many achievements, it has many inadequacies. There is a need for a clearer definition of goals and an overhaul of the educational process. Although a lack of well-defined objectives and inadequate measuring procedures have prevented its effective use, the systems analysis methodology used by business can be applied to the problems of education. A proposed system, the "organic curriculum," will make possible the achievement of the objectives of preparing students with entry-level job skills, basic learning skills, cross-training in a cluster of occupations, training for the roles of citizens and adults, and personal development skills such as communication, inquiry, and problem solving. A student who graduates from high school should have the necessary

qualifications for maximum flexibility in post-high school options. The integration and interaction of vital components that will result from a systems design will insure the most efficient and effective learning for the individual student through individually prescribed programs leading logically to achievement of adult behavioral goals. Steps for implementing the systematic approach include stating the program output specifications in terms of behavioral objectives, systhesizing the objectives among the various disciplines, developing appropriate materials and measurement instruments, and selecting media. Seventeen school districts have been selected to prepare for the new "organic curriculum" while the behavioral objectives are being developed. The plan calls for an investment of $30,000 over the next 5 years. In summary, this educational program incorporates the idea of a continuous program curriculum with instructional techniques that emphasize active development, positive achievement, and self-direction of students.

8. Center for Vocational and Technical Education. Program, planning, budgeting systems for educators. Volume I: An instructional outline. Leadership series no. 18. Columbus: Center for Vocational and Technical Education, Ohio State University, August 1969. 279p. ED 032 417 MF $1.25 HC $14.05. (Also available from the Center for Vocational and Technical Education, The Ohio State University, 1900 Kenny Road, Columbus, Ohio 43210, for $4.00.)

   Planning, Programing, Budgeting System (PPBS) includes concepts and techniques for resource allocation decision making for rational and effective programing. Most Federal agencies use PPBS for the development, analysis, and presentation of resource needs. Traditional methods of budgeting focus primarily on resource inputs; PPBS focuses on both inputs (cost) and outputs (benefits). The guidelines in this volume suggest initial training in a sequential pattern for a course in PPBS. Examples used are drawn from the field of vocational education. Included in the instructional outline are sections relating to: (1) overview, (2) systems theory, (3) the planning process, (4) investment alternatives, (5) program budgeting, (6) analysis of alternatives, (7) programing and management control, (8) basic data for PPBS, and (9) limitation of PPBS. The document contains three parts: The What-When-Where-Who-Why of This Educational Program, An Educational Training Program in PPBS, and Supplement to the Basic Educational Program. The supplements include pre- and post-tests, a conceptual framework, the relationship of education and economics, and methods of statistical analysis in PPBS.

9. Cogswell, John F. New solutions to implementing instructional media through analysis and simulation of school organization. Santa Monica: System Development Corporation, March 24, 1964. 12p. ED 010 580

MF $0.25 HC $0.70.

A project was described that would use systems analysis and computer-simulation techniques to find new ways to implement instructional media. The four major steps to be taken for this study are: (1) Survey and selection of high schools, (2) system analysis of the five high schools selected for study, (3) construction of a computer-simulation vehicle to build models of the schools and of hypothetical changes in the schools, and (4) simulation and study of five schools selected ranging from fairly traditional to highly innovative. The schools are being selected by analysis of questionnaires submitted to 200 high schools identified by State departments of education as being involved in innovation. At the time of reporting, two of the five schools had been selected. There were the continuous-progress-plan school developed by Dr. Edwin Read at Brigham Young Laboratory School and the Culver City High School in Los Angeles. Analysis of the schools consists of (1) collecting data descriptive of the high school, and (2) translating the data into flow-charts. Following the analysis, design changes in the organizational structure to facilitate use of the new media will be suggested and these changes will be evaluated by use of the computer-simulation vehicle.

10. Cogswell, John F. Nova high school--description of tenth-grade social studies course. Santa Monica: System Development Corporation, February 23, 1966. 14p. ED 010 569 MF $0.25 HC $0.80.

Systems analysis and computer-simulation techniques were applied in a study of innovation for a 10th-grade social studies course. The course content was American history which was divided into 10 content areas such as colonial, revolutionary, and constitutional American. The activities of the course included team teaching, lectures, media presentations, group study, unit quizzes, and individual study. Descriptions were presented of (1) special study subgroups and seminar groups, (2) the media used in the groups, (3) information and record processing procedures, and (4) the use of school space.

11. Cogswell, John F. Nova high school--system analysis. Santa Monica: System Development Corporation, February 25, 1966. 19p. ED 010 570 MF $0.25 HC $1.05.

A systems analysis was made of a 10th-grade social studies course in American history taught at the Nova High School, Fort Lauderdale, Florida, to evaluate the course as an instructional system. The analysis was concerned with such problem areas as teacher role, the effects of media on student-teacher relationships, information requirements, the use of space, and the effects of course procedures on students. A computer-simulation model of the course was set up and

tested. Data produced by the model were compared to data that were descriptive of the course. There was a high degree of correspondence between the simulated data and the descriptive data, indicating that the simulation procedures were effective in producing data that appeared to be valid.

12. Cogswell, John F., and Marsh, Donald G. System design for a continuous progress school--computer simulation of autonomous scheduling procedures. Santa Monica: System Development Corporation, March 21, 1966. 21p. ED 010 564 MF $0.25 HC $1.15.

    A computer simulation of a continuous-progress school that permits students to schedule themselves for course work on an autonomous basis was constructed and tested. The system was set up to free the student from the disadvantages of traditional progression by allowing him to work in other courses while waiting for teaching assistance in another. Patterns of resource demand were determined for the assignment of 100 high school students to five courses at one time. Whenever such a student would require help, he could file a request for help and go on to his work on another course. The system was deemed useful for expanding simulation capability and for exploring its uses in course design. It was developed in association with the continuous-progress-school plan of Dr. Edwin Read of the Brigham Young University Laboratory School.

13. Cogswell, John F., and others. Analysis of instructional systems. Report of a project, new solutions to implementing instructional media through analysis and simulation of school organization. Final report. Santa Monica: System Development Corporation, 1966. 272p. ED 010 577 MF $0.45 HC $13.70.

    The uses of systems analysis and computer simulation of school organization were explored to find new ways to implement instructional media. The uses of systems analysis recommended were (1) to facilitate improvement of present instructional and educational planning systems and (2) to explore the feasibility of proposed school organizations. The recommended procedures for using systems analysis were as follows: (1) to define the major overall problem to be solved, (2) to make a model of the system, and (3) to use the model to study the effects of changes of the system. A technique called "EDSIM" was developed as part of the project to model a system by means of a computer program. Following 11 analyses of school organizations, it was concluded that altering school organizations to accommodate individual differences of students requires (1) adequate self-study instructional materials, and (2) adequate systems to provide information to instructors, counselors, and administrators about the status of individual students. To meet these needs, the investigators recommended continued development of the

computer-based system to assist students and counselors in planning, continued study of the use of information processing for student instruction, inservice training of selected school personnel in the preparation of individualized course materials, and development of procedures for the management of changes in schools.

14. Cogswell, John, and others. A computer simulation vehicle for educational systems. Santa Monica: System Development Corporation, March 22, 1965. 33p. ED 010 579 MF $0.25 HC $1.75.

    Characteristics and construction of a computer-simulation model for simulating behavior of students and staff in a school are described. This model incorporated systems analysis and computer-simulation techniques and was expected to provide design recommendations for more pervasive and integrated changes throughout the schools. The model was constructed so that a high school can be described in terms of school characteristics and student characteristics that bear on the instructional plan of the school. A full description of the model and plans for simulation of selected high schools was presented.

15. Cogswell, John F., and others. Construction of school simulation vehicle. Santa Monica: System Development Corporation, August 6, 1963. 50p. ED 010 559 MF $0.25 HC $2.60.

    A computer-programed general school simulator is described and rules are given for a computer tryout of the pilot version. Although the model was designed as a general vehicle that would permit computer modeling of any school configuration, the first pilot version represents a hypothetical school operating under the "continuous progress plan" which provides for students to be assigned to both group and individualized instruction. Plans called for the general model to be developed by modeling and making computer runs of a series of versions of the simulator based on such factors as school operations and organizational configurations. A data analysis and reduction program also will be developed in successive stages. Flow diagrams of the various procedures of the system are included.

16. Cogswell, John F., and others. Construction and use of the school simulation vehicle. Santa Monica: System Development Corporation, September 1, 1964. 21p. ED 010 581 MF $0.25 HC $1.15.

    The plans for a simulation model using systems analysis and computer simulation techniques were presented. The techniques and design recommendations were intended to find new methods for implementing instructional media. Four major steps were involved in the project: (1) Survey and selection of high schools, (2) systems analysis of five

high schools selected, (3) construction of a computer simulation vehicle, and (4) simulation and study of the five high schools with the model. The report concentrated on discussion of the construction of the model and the simulation study. The model was constructed to describe a school in terms of its characteristics and student characteristics that bear on the instructional plan of the school. Preliminary studies with the model were being conducted that involve the modeling aspects of the continuous progress plan. This plan was designed to permit students to progress at their individual rates. The real test of the model's validity will come when its predicted effects are in fact carried out in the school environment.

17. Cogswell, John F., and others. Purpose and strategy of the school simulation project. Special report. Santa Monica: System Development Corporation, December 19, 1963. 17p. ED 010 560 MF $0.25 HC $0.95.

    A general description was presented of the school-simulation project which used systems analysis and computer-simulation techniques for studying organizational changes in education. The organizational modifications studied were applicable to the implementation of instructional innovations. Five high schools, varying in the extent they were innovative, were selected for analysis. A computer-based simulation vehicle was planned for serving as a conceptual tool in the generation of research hypotheses on ways in which school design and organization could be improved. Within the strategy of the project, seven tenets were listed and discussed. Flowcharts of study procedures and of interaction among these procedures were included.

18. Cohen, David M., and Dubin, Samuel S. A systems approach to updating professional personnel. Paper presented at the National Seminar on Adult Education Research--Toronto, February 9-11, 1969. 12p. ED 025 718 MF $0.25 HC $0.70.

    Professional updating processes can be visualized as a system enabling both educators and professionals to enhance individual competence. The systems analysis model given here represents updating practices both pictorially and mathematically. Strengths of the model are: the model incorporates educational, psychological, and motivational factors from a systems viewpoint; the model enables the determination of the most influential variables in the updating process; the model can be developed for both individuals and groups; and parameters of mathematical models can be estimated or determined with standard statistical procedures. Weaknesses are: The model is somewhat simplified and may not include all possible parameters; negative feedback is not recognized; the problem of statistical estimation of parameters is still

unresolved; and the assumption that updating is a consistently non-decreasing process can be questioned. (Seven figures are included.)

19. Cook, Desmond L. Better project planning and control through the use of system analysis and management techniques. Paper presented at the Symposium on Operations Analysis of Education, sponsored by the National Center for Educational Statistics--Washington, D.C., November 20-22, 1967. 17p. ED 019 729 MF $0.25 HC $0.95.

    The combined application of system analysis and management techniques is described as an effective way to achieve optimum results in the planning and execution of projects in the field of education. Projects of this type are generally finite, complex, homogenous, and non-repetitive. Systems analysis of a project includes its disassembly into components and its reassembly through a synthesis based on a linear flowchart approach incorporating time, cost, and performance variables. Suggestions include how to think of a project as a system, the importance of establishing specific goals, the types of project control, and the contribution system analysis can make to the function of management in education.

20. Cook, Desmond L. The impact of systems analysis on education. Paper presented at Seminar on Systems Analysis--Temple University, Philadelphia, Pennsylvania, April 18, 1968. 12p. ED 024 145 MF $0.25 HC $0.70.

    The nature and extent of systems analysis in education are discussed in terms of the following specific applications: (1) Instructional systems where the concern is with the components of the system (e.g., teachers, students, material to be taught, or audiovisual systems) and their interaction in the learning process, (2) project management systems for the planning and controlling of a wide variety of educational projects, (3) management information systems for better decision making by chief school officials, (4) planning-programing-budgeting systems for selecting among alternatives to reach program goals, and (5) operations research, which attempts to identify the relevant variables making up the total system and subsystems and to secure quantitative data for each variable. Two problems involved in discussing systems analysis in education--terminology and the difficulty of securing evidence about its impact and application--are outlined. Warnings and recommendations regarding the role of systems analysis in education are presented.

21. Cook, Desmond L. Participant followup study—the PERT lectures, a case study in knowledge dissemination and utilization, volume 2. Columbus: College of Education, Ohio State University, August 1966.

79p. ED 010 372 MF $0.50 HC $4.05.

A followup study was conducted of the PERT (program evaluation and review technique) lectures, conducted in 1965 to inform the educational community of PERT and to encourage its use. Questionnaires were sent to 397 lecture participants to determine the degree of utilization of the information presented and to seek information on the dissemination process in education. The questionnaire was specifically designed to provide information on (1) the nature of the audience, (2) plans for utilization, (3) quality of the message, and (4) preferences for dissemination activities. Questionnaires were returned by 294 respondents. Several conclusions were developed, one of which was that the audience consisted of persons who attended out of curiosity and whose professional interests did not reside exclusively in educational research and development. Suggested were recommendations that the background of future participants be assessed and that more workshop activities be included in future programs.

22. Cook, Desmond L. PERT applications in educational planning. Paper presented at the annual meeting of the Association of Educational Data Systems--Philadelphia, Pennsylvania, May 23, 1966. 13p. ED 019 751 MF $0.25 HC $0.75.

This paper discusses the concepts of educational planning, the program evaluation and review technique (PERT), and the potential value that PERT has for educational planning. The discussion of planning is limited to short-run educational projects. The nature of PERT is discussed and its applicability to planning is established. Several benefits that result when PERT principles are applied to the planning function associated with educational research are noted: (1) PERT often results in clearer statement of project objectives and goals, (2) PERT requires that those involved in the project make explicit the means by which they plan to reach the objective, (3) the use of PERT results in clearer definition of each actual task to be done, (4) the use of PERT enables the project manager to identify at an early stage the potential trouble spots in the project plan, (5) the use of PERT assists a project manager to know where to replan in the event that the original plan is inappropriate for some reason, and (6) the use of network techniques facilitates the communication process since plans are portrayed in a graphic manner.

23. Cook, Desmond L. Program evaluation and review technique--applications in education. Washington, D.C.: Office of Education, 1966. 109p. ED 015 533 MF $0.50 HC not available from EDRS. (Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402; FS 5.212-12024, for $0.45.)

This monograph is intended to disseminate to the educational community the basic concepts and principles of a recently developed project management information system entitled program evaluation and review technique (PERT). PERT is a methodology for planning the diverse activities in either large or small projects. Steps of the PERT technique include work breakdown structure, network development, activity time estimation, network time calculation, scheduling, probability aspects of PERT, replanning the project, and an introduction to PERT-cost. Several models are presented to illustrate areas in which PERT can be applied to educational research and development projects: (1) Experimental research, (2) survey research, (3) historical research, (4) developmental projects, (5) curriculum development, (6) educational service projects, (7) research integration projects, and (8) theory development projects. Practical considerations for implementing PERT on educational research and development projects are also included.

24. Cook, Desmond L. References on network planning in education, research management, project selection, and program management. (Title supplied). Columbus: Educational Research Management Center, Ohio State University, September 7, 1966. 9p. ED 020 580 MF $0.25 HC $0.55.

This bibliographic listing of 109 related addresses, articles, books, microfilms, monographs, reports, and other items, published between 1959 and 1968, includes 39 items on network planning, 48 items on research management, 13 items on project selection, and nine items on program management.

25. Cook, Desmond L. The use of systems analysis and management techniques in program planning and evaluation. Paper presented at the Symposium on the Application of Systems Analysis and Management Techniques to Educational Planning in California--Chapman College, Orange, California, June 12-13, 1967. 11p. ED 019 752 MF $0.25 HC $0.65.

This paper discusses the uses of systems analysis and management techniques in program planning and evaluation. The discussion focuses on the general concept of management systems and, within this concept, on the nature and function of management information systems. Throughout the presentation an attempt is made to interrelate the concepts of systems analysis, program planning, and evaluation. Also presented is an overview of network-based management systems of which the two most popularly known examples are PERT and the critical path method.

26. Cooley, William W., and Glaser, Robert. An information and management system for individually prescribed instruction. Working paper 44. Pittsburgh: Learning Research and Development Center, University of Pittsburgh, 1968. 35p. ED 026 862 MF $0.25 HC $1.85.

A model of the educational process and a derived procedure series for implementing an individualized instruction system are presented. The application of computer technology to individualized instruction requires an operational definition of the educational process in terms of school practices. A process model involving three major sets of variables--educational goals, individual capabilities, and instructional means--with means a function of goals and capabilities, is outlined. Following upon this conceptual model, an instructional model and the functional basis of an individually prescribed instruction (IPI) system are developed as a sequence of operations. As instruction proceeds, performance is monitored and assessed, and necessary adapations occur at subgoal decision points. The system is also evolutionary; it is able to compare interim student behavior and final outcomes with predictions of original operational functions and to provide the basis for modification when appropriate. Experience obtained in introducing computer assistance into a currently operational IPI system is described at length, and system research abilities, including a cumulative data bank for basic learning and measurement studies, are discussed.

27. Crawford, Meredith P. Simulation in training and education. Alexandria, Virginia, George Washington University, September 1967. 22p. ED 016 172 Not available from EDRS. (Available from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151; MF $0.65 HC $3.00.)

The key concepts of system and simulation as they are applied to training and education are discussed. The general characteristics of machine-ascendant systems that facilitate the orderly design process of training simulators are presented: (1) Purpose of the system and limits of acceptable human behavior, (2) response characteristics of the system to its operating environment specified in quantitative forms, (3) performance requirements for control of the machine involving psychological processes, and (4) criteria for evaluating the performance of the system derived from design specifications. Organizational psychology is discussed as well as examples of simulation in education which include management behavior in business and educational administration, teacher training, and interpersonal learning. The general characteristics are then used as a frame of reference for comment on the use of simulation in education.

28. Crossman, David M. New learning techniques via audiovisual media. American School and University (May 1966). ED 019 818 Not available from EDRS. (Available from Editor, Buttenheim Publishing Corporation, 757 Third Avenue, New York, New York 10017.)

In education, one of the most encouraging developments is an increased awareness in the critical nature of good communication. This article discusses the systems approach in developing learning techniques with audiovisual media. A system may be defined as the structure or organization of an orderly whole, clearly showing the interrelationships of the parts to each other and to the whole itself. This approach is discussed with reference to systems for large group instruction and systems for individual study. Electronic study carrels, standard dial telephones, and the computer are briefly discussed as possible media to use in this systems approach.

29. Dressel, Paul L., and others. A procedural and cost analysis study of media in instructional systems development. Quarterly technical report. East Lansing: Michigan State University, March 31, 1965. 89p. ED 011 050 MF $0.50 HC $4.55.

A broad study was conducted of the developmental procedures and costs of the newer media prepared for course instruction at Michigan State University. Details of the study were presented in two seminar papers that were prepared as dissemination reports in 1965 at the National Conference of the American Educational Research Association in Chicago, and at the Department of Audiovisual Instruction Convention in Milwaukee. The first paper discussed the relation of systems methodology to university curricular and instructional planning. Attention was focused on (1) the analysis of the components required within the instructional system, (2) the design of developmental procedures needed to produce the system, and (3) field trials of these developmental procedures. The second paper discussed the functions of the media specialist by identifying a logical sequence of major decisions and analyzing the problems of translating decisions into actual instructional materials. Means of motivating faculty to undertake use of newer media were also discussed.

30. Easley, J.A., Jr. A project to develop and evaluate a computerized system for instructional response analysis; project SIRA. Final report. Urbana: Computer-Based Education Laboratory, University of Illinois, September 1968. 49p. ED 027 751 MF $0.25 HC $2.55.

Project SIRA (System for Instructional Response Analysis) used a systems approach to develop a complete range of programs and techniques for both evaluation of student performance and evaluation

and revision of computer-assisted instruction (CAI) lesson material. By use of the PLATO computer-based instructional hardware system at the University of Illinois, SIRA developed techniques depending on preprocessed or preselected data and two advanced techniques making use of completely unprocessed student response data as input for general pattern detection methods. While rapid evolution of CAI software and changes in author and user population have altered the utility of early SIRA routines, the most useful SIRA-instigated functions have survived by being incorporated into present software. Appendices include a glossary of SIRA programs, student reactions to extended CAI sessions, curriculum development based on student responses, and revision of a course based on student response analysis.

31. Easton, David. Social Science Education Consortium. Publication 104, a systems approach to political life. Lafayette, Indiana: Purdue University, March 1966. 27p. ED 013 997 MF $0.25 HC $1.45.

A detailed analysis of a theoretical political system is presented in this paper. This political system is based on the author's definition that political life concerns all the varieties of activity that significantly influence the authoritative or binding allocations of values adopted for society. An explanation is given of the significance of three of the concepts (allocation of values, authority, and society) that are essential parts of this definition. Viewing political life as a system of behavior, the author uses techniques of systems analysis to conceptualize the science of politics. This paper was written as part of the Social Science Education Consortium, a curriculum project designed to outline the concepts, methods, and structure of several of the social sciences for use by teachers and curriculum workers at all grade levels.

32. Educational Service Bureau, Inc. Systems planning in public education. Arlington, Virginia: Administrative Leadership Service, Educational Service Bureau, Inc., 1968. 32p. ED 026 743 Not available from EDRS. (Available from Administrative Leadership Service, Division of Educational Service Bureau, Inc., 1507 M Street, N.W., Washington, D.C. 20005 for $4.00.)

This study, based primarily on the experience of Seattle, Washington, deals with the application of the systems approach to educational planning. Section one defines and describes the concept of a system and the systems approach, and gives a general introduction to the use of systems analysis. Section two describes the development and use of the systems approach by the Seattle School District, with particular attention given to the process of planning for its use. In the third section, planning theory and the administrator's role receive attention; topics covered

include the meaning of systems planning, the dimensions of a plan, the process, and the categories of educational plans. The final section discusses organization and procedures for planning, covering such topics as functions of an Instructional Development Council, origin of ideas and routing of plans for instructional improvement, improvement of management, authorization for planning, parts of a plan, integration of planning, and implementation of plans. The study ends by suggesting where interested school administrators can seek assistance in developing a systems approach to educational planning.

33. Egbert, R. L. Buena Vista High School--an introduction. Santa Monica, California: System Development Corporation, February 1, 1966. 7p. ED 010 571 MF $0.25 HC $0.45.

An introduction is presented in the first of a series of three reports of the work done at Buena Vista High School in Saginaw, Michigan. The organizational modifications in education that support the use of instructional innovations were studied using systems analysis and computer simulation techniques. The general description of the high school included a community profile, the school design, and population. Included also were descriptions of personnel and facilities. A major innovation was the use of closed-circuit television combined with team teaching. The program included a telelesson of approximately 25 minutes followed by discussion for the remainder of the hour.

34. Egbert, R. L. Buena Vista High School--descriptive analysis. Santa Monica, California: System Development Corporation, February 2, 1966. 82p. ED 010 572 MF $0.50 HC $4.20.

A detailed system description of the 11th-grade English course which combines team teaching with closed-circuit television at the Buena Vista High School in Saginaw, Michigan, is presented. The second in a series of three reports, this report presents an analysis of (1) course operating procedures, (2) time spent in various groupings and activities, and (3) rotation of groups, materials, equipment, and space. Further descriptions are given of television activities, attendance checking and reporting, and personnel and job descriptions. Flowcharts and tables are included.

35. Egbert, Robert L., and Cogswell, John F. System design for a continuous progress school--part I. Santa Monica, California: System Development Corporation, February 28, 1964. 87p. ED 010 561 MF $0.50 HC $4.45.

The application of system analysis to educational problems of a continuous-progress-plan high school is described. This school plan involved radical departure from the traditional curriculum and an extensive use

of new media. Although no fully implemented continuous-progress school existed at the time of this report, the Brigham Young University Laboratory School had used parts of the plan at the elementary, junior high, and high school levels. The basic content of this report came from interviews with Dr. Edwin Read (who developed the continuous-progress school plan) and members of his staff at the Brigham Young University Laboratory School. Flow diagrams that were developed following the interviews are also included in the report. Topics covered are (1) an overview of the continuous-progress school, (2) student movement through the school, (3) preregistration and registration procedures, (4) course work in language arts and speech, and (5) special academic functions of test scoring and interpretation.

36. Emerson, William J., and others. EDP and the school administrator. American Association of School Administrators, 1967. 76p. ED 012 093 Not available from EDRS. (Available from the American Association of School Administrators, 1201 16th Street, N.W., Washington, D.C. 20036, for $3.00.)

    The present and future role of computers in education is examined in terms of preplanning, use, and function. Systems analysis is seen as the best means of viewing the total operation and of finding unifying patterns and logical, efficient operating procedures within the school system. Basic computer operations are described, and hardware and software are discussed. Libraries, computer-assisted instruction, and administrative information storage are suggested as areas of potential computer use. The importance of preparing school administrators to comprehend and use computer systems is stressed.

37. Evans, J.A. A framework for the evolutionary development of an executive information system. Paper distributed to California educational administrators participating in "Executive Information Systems" program of OPERATION PEP. Bedford, Massachusetts: Mitre Corporation, June 1968. 55p. ED 029 376 MF $0.25 HC $2.85.

    This document presents in schematic form a systems approach for the development of an executive information system. Although it does not use the traditional sentence and paragraph form, its diagrams, written in a sequence similar to computer programs, cover such topics as history of information systems, requirements analysis, how to begin building the system, organizational context, system goals, output tracing, data collection, system design and planning, and operational use and improvement. Some discussion of the usefulness of electronic data processing and hardware acquisition is provided.

38. Foley, Walter J. Conceptual problems. Paper presented at a symposium on the Assessment of the Impact of Title I of the Elementary and Secondary Education Act, February 8, 1968. 20p. ED 023 727 MF $0.25 HC $1.10.

A systems theory approach to information requirements in education and in evaluation strategies is applied to decision making. Educational decision making itself involves long-range planning, system structuring to implement goals, system allocation (cost), and system monitoring which provides the feedback. Each level requires differential information about such classification areas as curriculum, pupil, staff, finance, facility, and community. For the evaluation process a methodology is proposed that meets information needs by providing (1) data elements based on a common definition of each category, (2) a "picture of the relationships between data content across classification areas," (3) information on multiple questions across these areas, and (4) alternatives of cost, practice, and procedure. This theoretical structure is applied to both the evaluative and the decision-making process in educational programs.

39. Foster, Garrett R. A first step towards the implementation of the Cambridge mathematics curriculum in a K-12 ungraded school. Tallahassee: Florida State University, 1966. 94p. ED 010 003 MF $1.00 HC $4.80.

A series of three conferences was held to explore the feasibility of implementing a long-range curriculum development project for an ungraded, K-12 school, based on recommendations of the Cambridge Conference on School Mathematics. Over 50 mathematicians, mathematics educators, and persons involved in theoretical and applied psychological research, educational systems analysis, and academic games development participated. Principal areas of concern in the project were (1) curriculum development, (2) teacher training, (3) implications of learning and cognition theory, and (4) research and evaluation. Results of the conferences suggested that the subject mathematics curriculum could best be developed through an educational systems approach, using basic functional system conponents of instructional resources, systems modifiers, systems analysis, data storage and processing, an action monitor, and a value estimator. Additional discussion centered on the areas of curriculum content and matrices, student guides, and an inservice teacher-training program. It was recommended that a pilot project be conducted to involve a small portion of the school population prior to overall program implementation.

40. General Learning Corporation. Cost study of educational media systems and their equipment components. Volume I, guidelines for determining costs of media systems. Final report. Washington, D.C.: General Learning Corporation, May 1968. 78p. ED 024 273 MF $0.50 HC $4.00.

Objective cost estimates for planning and operating systems should be made after an assessment of administrative factors (school environment) and instructional factors (learning objectives, type of presentation). The specification of appropriate sensory stimuli and the design of alternative systems also precede cost estimations for production, distribution, and reception. Researchers define a hypothetical educational task as a basis for cost comparison of alternative systems, excluding computer-assisted instruction (CAI) from assessment charts. Cost-saving considerations modify the utilization and technology of media systems and the organization of educational systems. An appendix to Volume I presents methodology for estimating costs, a summary of CAI applications and expenses, and educational environment models.

41. Hartley, Harry J. Economic rationality in urban school planning--the program budget. Urban Education, v. 3, n. 1 (1967), p. 39-51. ED 017 564 Not available from EDRS.

Economic analysis should be applied to school planning to provide a general framework within which educational objectives can be accomplished in the most reasonable manner. Systems analysis models integrate the differing values of educators into common objectives. Successful use of program budgeting depends on (1) planning, structural design, and program definition; (2) programing, systems analysis, and budgeting; (3) information support, evaluation, and program revision. Examples of program budgeting in urban school systems and in noneducational settings are discussed and a list of advantages of the program budget in education is provided.

42. Hartley, Harry J. PPBS--current research and programmatic implications for collective negotiations. Paper presented to the American Educational Research Association--Chicago, Illinois, February 8-10, 1968. 10p. ED 018 856 MF $0.25 HC $0.60.

Planning-programing-budgeting systems (PPBS) are intended to facilitate the kinds of information and data analysis which furnish administrators with a more complete basis for rational choice. Neutral on the issues of cost reduction, PPBS is designed to foster economic efficiency. Advantages which it offers over traditional practices include: (1) Program-oriented information, (2) analysis of possible alternative programs and objectives, (3) long-range plans and evaluative criteria,

(4) use of contemporary management science concepts to improve utilization of teacher competence, (5) structural flexibility and participatory planning, and (6) report of school programs in the school budget document. Successful installation of the program budgeting format is dependent on completion of three kinds of research activities: (1) Program classification, structural design, and planning matrices; (2) programing, systems analysis, and budgeting; and (3) information support, evaluation, and program revision. The key to resolving recent educational disputes has been largely financial. Focus on programs would allow teachers, boards of education, administrators, and the general public to seek resources for needed programs, rather than for selfish ends.

43. Hills, R. Jean. The concept of system. Revision of paper presented at the annual meeting of the American Educational Research Association--New York, February 16, 1967. 26p. ED 014 786 MF $0.25 HC $1.40. (Also available from CASEA, University of Oregon, Eugene, Oregon 97403, for $1.00.)

The author reviews one of the basic social science concepts as it is utilized by professional social scientists, making a conceptual clarification of the term "system" as it relates to the field of school administration. Included in the analysis are key ideas expressed by the term, distinctions that serve as valuable guides in formulating problems for empirical research, and misuses of the term that deny it utility in scientific discourse.

44. Hitchcock, R.P., and Bliss, Shirley. Introduction to critical path scheduling. Olympia: Washington State Board for Vocational Education, 1964. 87p. ED 020 301 MF $0.50 HC $4.45.

Information is presented for student use in learning program evaluation and review technique (PERT), a project management system used to plan, control, and evaluate projects. The material was prepared in the IBM District 15 Educational Center to be used in vocational classes. The technique was developed during 1958 by the Navy for applying statistical and mathematical techniques to project management for a large weapons system, the polaris missile and submarine. The objectives of the test are to (1) introduce the student to PERT concepts, (2) provide problems and examples that will solidify his learning, (3) demonstrate how a computer is used with PERT, and (4) assemble information about the entire PERT cycle in one source. Upon completion of the course the student should be able to select a project where PERT may be beneficial, use PERT in planning and scheduling the project, apply costs to a PERT project, and provide management with useful information displays. Sections of the text cover (1) general information, (2) project planning, (3) project time scheduling, (4) resource scheduling, and (5) project

control. Diagrams, glossaries, tables, and references are included.

45. Johnson, Byron Lamar. Conference on systems approaches to curriculum and instruction in the open-door college, Los Angeles: University of California, January 1967. 73p. ED 013 090 MF $0.50 HC $3.75.

The systems approach to instruction involves a careful specification of learning objectives in behavioral and measurable form, followed by a succession of evaluation-revision cycles in the instructional process, until new students exposed to the process achieve the desired objectives. Seven major papers were presented at the conference: (1) The relationship of instructional programs to the junior college's commitment to change; (2) opportunities and problems in the use of computers in instruction; (3) methods of preparing objectives to specify student action or the product of such action, the conditions under which the performance will occur, and the minimum acceptable standard of performance; (4) methods of developing and validating instructional materials for use in instructional systems; (5) a description of an operational program, the audiotutorial system of teaching botany at Purdue University; (6) a description of the application of the systems approach at Oakland Community College; and (7) the use of the systems approach in developmental programs. Emphasis throughout the conference was on the development of learning experiences in relation to educational purposes and objectives, the need for feedback, and the necessity for constant evaluation, revision, and improvement of the system.

46. Judy, Richard W., and Levine, Jack G. A new tool for educational administrators. Educational efficiency through simulation analysis. Toronto: Association of Universities and Colleges in Canada, 1965. ED 017 145 Not available from EDRS. (Available from the University of Toronto Press, University of Toronto 5, Canada.)

In a study at the University of Toronto, Canada, a simulation model was developed to aid institutional planning for the undergraduate level of higher education. By developing a conceptual framework for the quantification of resource management, the authors explore the education function in terms of the factors of control affecting decision making by the administration. The system simulation model "campus" imitates the interaction of important activity levels, uncontrollable variables, system parameters, and resource requirements. The areas analyzed by using the model are enrollment formulation, resource loading, space requirements, and budgetary calculation. Benefits of this system include information for planning, justification of budgets, and evaluation of proposed changes in system parameters.

47. Jung, Charles, and others. Appendix N. Implementation of the RUPS System in a total school district. Portland: Northwest Regional Educational Laboratory, October 1968. 42p. ED 026 319 MF $0.25 HC $2.20.

The implementation in a school district of the Research Utilization and Problem Solving (RUPS) System is demonstrated. RUPS is an instructional system for an inservice program designed to provide the needed competencies for an entire staff to engage in systems analysis and systems synthesis procedures prior to assessing educational needs and developing curriculum to meet the needs. Thirteen instructional problems (or instructional subsets) necessitating research utilization and problem-solving skills are delineated: Identifying a problem, using research about the classroom, diagnosis using force-field technique, diagnosing teamwork relationship, data gathering skills, selecting tools for data collection, spotting the major results in data, anchored trainer ratings, the concept of feedback, deriving implications and action alternatives, planning for action, small group dynamics, and planning for action practicum. Instructional/learning objectives and product performance specifications are provided for each instructional subset. Where appropriate, instructional strategy steps and materials are also specified.

48. Karwin, Thomas J. Instructional design, recorded instruction and faculty interests. Supplement; instructional design, recorded instruction and faculty interests within the University of California. Occasional paper No. 2. Santa Cruz: Office of Instructional Services, University of California, April 1968. 96p. ED 020 682 MF $0.50 HC $4.90.

The systems approach to planning is useful in designing more effective and efficient instructional programs. It specifies instructional objectives, coordinates appropriate methods, and evaluates the resulting instructional system. Conflicts can arise from individual interpretations of interest in specific programs. A comprehensive, equitable policy outlining the interests, rights, and responsibilities of faculty, institution, and staff in relation to the design and development of instructional programs using new media will obviate these conflicts. These considerations are examined in the order they would be encountered in a design project. Policy decisions on contracts, obligations, authorship, subsequent use of the material, terms of publication, copyrights, and authority must be set out in planning the project and in conducting it. These decisions provide a base for policy designed to encourage and facilitate the realization of the potential of instructional system design. Appended are two case studies of instructional design. A supplement, with its appendices, reviews policies and regulations of the University of California with respect to the basic criteria presented in the paper.

49. Knezevich, S.J. The systems approach to school administration: Some perceptions on the state of the art in 1967. Paper presented at the U.S. Office of Education Symposium on Operations Analysis of Education, November 19-22, 1967. 14p. ED 025 853 MF $0.25 HC $0.80.

Concepts that are salient features of the systems approach do not appear to have permeated school administration beyond the threshold of awareness. Confusion among administrators as to the meaning and potential of the systems approach can be partly attributed to its overzealous adherents, semantic difficulties among experts, and its application to minor, pedestrian problems. Experts must agree on standard meanings for such terms as systems analysis, program budgeting, programing-planning-budgeting systems (PPBS), and cost effectiveness, which are alternatively used synonomously and to mean different things. Major policy issues that create the greatest administrative problems must be shown to be susceptible to the systems approach. The potential of this approach for educational administration will have to be publicized through special seminars, conferences, and workshops. Finally, to create readiness for and to stimulate use of the systems approach, improvements in education that will be needed include (1) a clearer definition of educational objectives, (2) use of models for at least parts of school operations, (3) development of quantitative reasoning and analysis capabilities, (4) greater emphasis on generating alternative solutions to problems, (5) increases in school district staffs for planning and systems analysis, and (6) better dissemination of systems concepts and techniques.

50. Koenig, H.E. A systems model for management, planning, and resource allocation in institutions of higher education. Final report. East Lansing: Division of Engineering Research, Michigan State University, September 30, 1968. 497p. ED 027 831 MF $2.00 HC $24.95.

From the systems point of view, the objectives of higher education cannot be defined apart from the economic and social context in which the university operates. The report presents the results of a 4-year research project during which a mathematical model was developed to describe the way in which the university, as a part of a socioeconomic system, utilizes its resources in production. The model, designed to aid university administrators in the overall allocation of resources, consists of sets of equations that describe the relationship of resources to production, and based on these, the associated unit costs of production. Resources (input) are described as personnel, space, and equipment; and products (output) as developed manpower, research, and public or technical services. The model does not tell the decision maker how to create a more effective educational institution, but provides him with a tool for evaluating the changes in the types of resources--or the potential economic gain--that could result from proposed changes in the design of the

institution. The report contains a brief nontechnical review and a detailed technical description of the model, and discussion on and examples of how to use it in administration. Documented descriptions of data processing and simulation programs are also included, as well as a bibliography and auxiliary reports that were developed during the project.

51. Kraft, Richard H. P., (Ed.). Strategies of educational planning. Proceedings of the annual conference on the Economics of Education (2nd, Tallahassee, Florida, July 1968). Tallahassee: Educational Systems Development Center, Florida State University, 1969. 309p. ED 027 615 MF $1.25 HC $15.55.

    Eight papers focus on strategies for educational planning. In "Policy Formulation and Policy Implementation Relationships in an Educational System," Donald Miller asserts that performance relationships can be explained in terms of an educational system and its environment. Arnold Reisman and Martin Taft present "A Systems Approach to the Evaluation and Budgeting of Educational Programs." Richard Goodman examines the PPBS approach in "PPBS: Challenge to Educational Planners." Marvin Hoffenberg considers program budgeting for school system management in "Program Budgeting in Education: Some Organizational Implications." Richard Kraft examines the role of the educational planner in "Changing Manpower Needs and Educational Obsolescence: Implications for Vocational-Technical Education Planning." Desmond Cook discusses three "Economic Considerations in Educational Project Planning." An economic analysis of tomorrow's school is presented by C.W. McGuffey in "Economic Planning for the Future Development of Educational Facilities." Robert Campbell contrasts the economic approach to educational demand analysis with other approaches in "Approaches to the Analysis of the Demand for Higher Education: A Tool for Educational Planning."

52. Lanham, Frank W. A planning study to determine the feasibility of developing a new business and office curriculum. Columbus: Center for Vocational & Technical Education, Ohio State University, June 1968. 122p. ED 023 894 MF $0.50 HC $6.20.

    The purpose of this study was to explore the feasibility of utilizing the systems approach in developing an office occupations curriculum congruent with concepts in the organic curriculum theory. The title of this project is New Office and Business Education Learning System (NOBELS). An analog system model was developed as the framework in which NOBELS could be developed and tested. The feasibility of NOBELS was evaluated by four criteria: (1) The plan was supported by professional leadership, (2) the plan evolved from available interdisciplinary thinking, (3) the

plan provided a structure with profession-wide support and a feasible operational structure, and (4) dissemination and determination of dissemination, advocates, and acceptors were an integral part of the overall plan. Face-to-face meetings were held to solve problems and conflicts. Six drafts were written before all criteria of feasibility were determined to be met.

53. Lewis, David Alfred. Inception, design and implementation of a management information system. Dissertation submitted to American University, Washington, D.C., 1967. 54p. ED 014 792 Not available from EDRS. (Available from Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151; AD 646 851, for MF $0.65 HC $3.00.)

The purpose of this paper is to develop an instructional and systematic approach to the design and implementation of a management information system. Goals, objectives, structure, and responsiblities form the framework of a management information system. The task of a management information system is to process raw data in such a way as to generate the information required for management use. The system is composed of five integrated subsystems--information, personnel, communications, hardware, and software. The four basic goals of this system include: (1) Timely, accurate delivery of information when and where needed, (2) filtered distribution of information, (3) ready assemblage of information for special reports, and (4) execution of feasible controls through internal system logic. An overview of design in terms of systems integration and an analysis of the concept of total management information systems are made.

54. Liebeskind, Morris. Design and construction of school buildings. Proceedings, Association of School Business Officials of the United States and Canada, annual meeting and educational exhibit. (San Francisco, October 21-22, 1964). Chicago: Association of School Business Officials, 1965. 16p. ED 020 624 MF $0.25 HC $0.90. (Entire proceedings of this meeting available from Charles W. Foster, Office of the Executive Secretary, 2424 West Lawrence Avenue, Chicago, Illinois 60624, for $5.00.)

Problems in the scheduling and completion of school building design and construction projects are discussed with reference to the critical path method (CPM) of programing. The discussion gives a broad overview of the method with detailed suggestions for school administrators. Specific subject areas include: (1) CPM, a new management tool, (2) CPM defined, (3) the bar diagram--its disadvantages, (4) methods of using CPM in construction, (5) CPM specification requirements, and (6) benefits and

advantages of CPM to school business officials. The problems and practices of using computer programing with CPM are discussed, including the details of progress computer runs. Examples are drawn from the application of CPM by the Board of Education of the City of New York, and by a specific junior high school in the Bronx. Some references are included for further background reading in CPM.

55. Loughary, John W. Man-machine systems in education. 1966. ED 014 888 Not available from EDRS. (Available from Harper and Row, Publishers, Inc., 49 East 33rd Street, New York, New York 10016.)

Part 1 of this book, Background, provides a theoretical and conceptual base for the man-machine systems described later; man-machine systems are defined, computers are described, and the relationships between media technology and learning processes are discussed. Part 2, Instruction, describes advanced systems in education that are concerned primarily with instruction as such. Part 3, Administration, examines applications of systems at three management and executive levels--the school, the district, and the State and national levels. Part 4, Pupil Personnel Services, describes computer systems in counseling and other areas. Requirements for implementing man-machine systems are discussed in part 5.

56. Mansergh, Gerald G. (Ed.). Systems approaches to the management of public education. Detroit: Metropolitan Detroit Bureau of School Studies, Inc., April 1969. 53p. ED 031 788 MF $0.25 HC $2.75. (Also available from the Metropolitan Detroit Bureau of School Studies, Inc., Fairmont Bldg., Wayne State University, 680 Merrick Street, Detroit, Michigan 48202; $3.00 members, $5.00 nonmembers.)

Three major presentations made at an October 1968 conference at Hartland, Michigan, for public school administrators and university professors are "The Systems Movement and Educational Administration," by Glenn L. Immegart; "Cost-Utility Analysis and Educational Decision-Making," by Austin D. Swanson; and "Educational Planning, Programing, and Budgeting: A Systems Approach," by Harry J. Hartley. Immegart defines the systems movement, outlines 11 approaches within the field (cybernetics, operations research, etc.), reviews models and procedures, and suggests problems related to use of the systems approach in educational administration. Swanson describes the general input-output model, discusses measurement indexes, explains alternate strategies in subsystem application, and emphasizes optimizing the combined output of subsystems. Hartley outlines the present limitations of the systems approach in local schools, compares various stages of budgetary reform with traditional incremental practices in local school planning, portrays the primary conceptual and operational elements of PPBS, and describes three program

budgeting installations: Dade County, New York City, and Sacramento. Bibliographies are appended.

57. McIsaac, Donald N., Jr., and others. A time-cost management system for use in educational planning. Madison: Department of Educational Administration, University of Wisconsin, January 1969. 110p. ED 025 935 Not available from EDRS. (Available from University of Wisconsin, Department of Educational Administration, Information Systems, 415 W. Gilman Station, Madison, Wisconsin 53706).

    Although prepared specifically for the Denver Public Schools, this manual provides some of the basic understanding required for the proper execution of educational planning based on PERT/CPM techniques. The theory of PERT/CPM and the fundamental processes involved therein are elucidated in the first part of the manual while the operating procedures that deal in particular with the Denver Public Schools are covered in the second part. The appendix contains material which specifically relates to the educational planning in two Denver schools.

58. McKee, Robert L., and Ridley, Kathryn J. Documentation of steps to establish a technical college, and the evaluation of "PERT" as a planning tool for educators, phase I. Baileys Crossroads, Virginia: Northern Virginia Technical College, March 31, 1966. 80p. ED 010 020 MF $0.50 HC $4.10.

    To establish a college in 100 days presented an opportunity to test the value of programed organizational procedures using program performance evaluation and review technique (PERT) under actual operational conditions, not in a simulated theoretical situation. Through the aid of the PERT planning system, it was determined that there were nine major lines of activities and about 300 events to be accomplished to open the college. The administration used a term approach whereby the three main administrators would focus attention on a major activity, plan and start its evolution, assign it to a staff member for completion, and then initiate the next activity. The college was built and established in 84 working days after the first staff member reported, and opened on schedule with 700 students. The regular PERT system was not used because the college had to be ready in such a short period of time--instead a simplified chart taken from the master chart was used. Many of the activities and events had to be accomplished out of sequence and accelerated due to the lack of time to continually update such a complicated system. The PERT system is a valuable aid in the planning of the logical steps to be followed--it enables a constant progress check to be made and it graphically demonstrates bottlenecks or time lags in the schedule. The college will use the PERT system more extensively in the planning and building of its next campus when a normal time schedule is possible.

59. Meckley, Richard F., and others. A guide to systematic planning for vocational and technical schools. Research 22. Columbus: Center for Vocational and Technical Education, Ohio State University, December 1968. 33p. ED 026 537 MF $0.25 HC $1.75. (Also available from the Center for Vocational and Technical Education, Ohio State University, 1900 Kenny Road, Columbus, Ohio 43212, for $1.50.)

A school planning scheme involving 46 principle activities that occur over a 38-month period is presented. This scheme was developed for individuals responsible for the planning of vocational and technical schools, i.e., supervisors, State staff, university school plant planners, architects, and local school administrators. The activities represent the major sequential tasks involved in the combined process of program and facility planning. Program evaluation and review technique (PERT) is the mode of organizing and presenting the activities, which includes a chart relating each activity and its description to PERT event numbers and to time-sequence monthly numbers. A fold-out sequence chart, glossary, and the selected bibliography are included. This is one of a series of guides for the planning of instructional area facilities for occupational preparation programs.

60. Miller, Donald R. Planning, developing and implementing title III, ESEA projects. Burlingame, California: Operation PEP, May 1968. 92p. ED 022 247 MF $0.50 HC $4.70.

This document analyzes the planning, developing, and implementing of fundable Title III, ESEA projects, by integrating the following five strategies: (1) A planning development and implementation strategy, (2) a risk-gain motivation strategy, (3) a problem-solving strategy, (4) a quality assurance and evaluation strategy, and (5) a management strategy. The analysis is intended for use as a reference by planners and a source of ideas for those preparing project proposals. Its framework and methodology provide a system approach to project planning and management.

61. Miller, Donald R. A system approach for solving educational problems. Burlingame, California: Operation PEP, October 25, 1967. 40p. ED 020 585 MF $0.25 HC. $2.10.

This paper investigates various aspects of the systems approach for solving educational problems: (1) The systems concept; (2) the reliability of the assumptions on which the systems approach is based; (3) the limitations inherent in the systems approach; (4) the human element and its relationship with the systems approach; (5) the ways the systems approach has been used to effectively solve problems; (6) what is meant by a system, system analysis, system synthesis, and system approach; and (7) the

benefits the systems approach offers to education. Also included is a model of a system approach as a logical tool for problem solving and a rationale and framework for implementing a systems approach in problem solving within the educational system.

62. Mood, Alexander M. On some basic steps in the application of systems analysis to instruction. Socio-Economic Planning Sciences, v. 1, pp. 19-26, (1967), ED 024 999 Not available from EDRS.

This paper presents a mathematical methodology in treating the systems approach to the evaluation of instruction. The major aspects of the procedure and the use of sensitivity analysis as a check upon the logical validity of the system are discussed. Advantages of a systems analysis when compared to qualitative analysis are also presented.

63. Norfleet, Morris. A systems approach to student personnel services. Kentucky: Morehead State University, 1968. 6p. ED 031 717 MF $0.25 HC. $0.40.

Increased enrollment and student activism have created a situation within student personnel services that almost defies most management systems. A systems approach can enable student personnel services to evaluate what they are doing to determine if counselors are making a difference in the lives of students. The characteristics of this approach are: (1) Statement of the real needs, (2) definition of behavioral objectives, (3) definition of constraints, (4) identification and analysis of alternatives, (5) identification of milestones, (6) implementation, (7) evaluation of the system, and (8) feedback and modification. Systems analysis offers several advantages among which are: (1) It focuses on process with a major emphasis on operations research, (2) it provides for adequate allocation of resources to best get the job done, (3) it provides a systematic and rational approach to analyzing the problematic situation, (4) it forces analyzers to think through the flow of the problem, and (5) it forces a comparison of alternatives in a complex situation.

64. Nachtigal, Paul. A computerized approach to the individualizing of instructional experiences. Colorado: Boulder Valley Public Schools. 22p. ED 014 226 MF $0.25 HC $1.20.

A conceptual model of the teaching-learning process uses a systems approach to allow computer analysis of the interaction of the variables. The process includes a teaching-learning environment, composed of variables in a curriculum module, the individual learner and his characteristic variables, and interaction of these two through a teaching—learning cycle. One systems organizer, or statement of educational goals, corresponds to each module and to a curriculum map that locates the

module according to sequence of difficulty and level of learning. Each module consists of variables relating to a specific behavorial objective, the learning content, and the learning process. Modules provide information used to make decisions regarding the learner and his environment. The teaching-learning cycle provides the framework for implementation of the decisions. Teachers use two computer data-files of curriculum modules and individual student characteristics to make instructional decisions. Implementation of the model will require restructuring of the curriculum by a team of educators, and inservice teacher training. The teacher's new role will be as tutor and consultant on learning activities. An elementary school language arts curriculum is the focus of a pilot project for this model.

65. Novick, David. Origin and history of program budgeting. Santa Monica: RAND Corporation, October 1966. ED 013 494 Not available from EDRS. (Available from Clearinghouse for Federal Scientific and Technical Information, Springfield, Viginia 22151, AD 641 442, $3.00 HC and $0.65 MF.)

The origin and historical development of program budgeting, which is currently applied to all the executive offices and agencies of the United States Government, are traced. It was recognized and applied as early as 1924 by industry, utilized as part of the wartime control system in 1942, and is used today by the Department of Defense. This is a transcription of a talk filmed for the courses sponsored by the U.S. Bureau of Budget and the U.S. Civil Service Commission for orientation and training in the planning-programing-budgeting system.

66. Ohm, Robert E. Organizational goals--a systems approach. Paper presented at the National Conference of Professors of Educational Administration--Indiana University, August 25, 1966. 16p. ED 010 710 MF $0.25 HC $0.90.

Contemporary systems theorists have provided a helpful view of the way goal-structure may shape administrative behavior in educational organizations. The "traditionalist" view assigned to organizational goals the functions of forecasting and planning. The "emerging model" viewed goals as undefined elements requiring little systematic treatment in a theory of administration. March and Simon, exemplifying modern thinking, consider goals as both operational (those permitting means-end analysis) and non-operational (those requiring subgoal specification before means-end analysis). This distinction presents differences in the decision-making process and illustrates the effect of goals on administrative structure. The view of goals as undefined "givens" has changed to one of goals as intrinsic functions in the administrative process. This project continues by classifying goals and constraints shaping a decision and explores an

identifiable function in the system. Although the model constructed needs testing, "differences among organizations in the distribution of goals (as classified by the model) would be presumed to be related to differences in structure and output." Administrators must not view goals as "givens" but as the central ordering process of a complex system.

67. Operation PEP. Symposium on the application of system analysis and management techniques to educational planning in California (Chapman College, Orange, California, June 12-13, 1967). Burlingame, California: Operation PEP, June 1967. 319p. ED 023 181 MF $1.25 HC $16.05.

    This is a collection of 21 reports presented at the 2-day symposium that ended the 18-month planning phase for OPERATION PEP. The symposium served as a culminating activity in a training program for 100 California educators in the application of systems analysis and management planning techniques. The reports, funded under Title III of ESEA, focus on the evaluation of management science as a fundamental mode of performance for educational planners in California.

68. Pfeiffer, John. Decision making in action. Chapter 2, new look at education: Systems analysis in our schools and colleges. 1968. 26p. ED 025 838 MF $0.25 HC $1.40. (Also available from The Odyssey Press, Inc., North Road, Poughkeepsie, New York 12601, for $1.00.)

    Developed during World War II, the systems approach evolved rapidly after the war into several new phases, one of which is program budgeting. There is no clear set of rules constructed along do-it-yourself lines associated with the systems approach. There are, however, general procedures that are to be followed. The first step, defining the problem, includes four distinct phases: Defining the system's objectives, obtaining measures of effectiveness, identifying constraints and uncontrollable variables, and identifying controllable variables. After defining the problem, the next three basic steps are to define the subfunctions, to define the alternative for each subfunction, and to synthesize the subsystems. Next a model should be developed. Although a model is an abstraction, it is also a highly effective way of coping with reality, and its development calls for and guides data collection. The model must prove itself by predicting results reasonably well. However, in complex situations perfect prediction is rare and the whole system must continually be reexamined and changed as necessary.

69. Ripley, Kathryn Jane. PERT as a management tool for educators. Paper presented at the Management Training Program for Educational Research Leaders--Ohio State University, April 24, 1968. 33p. ED 023 368 MF $0.25 HC $1.75.

Program evaluation and review technique (PERT) is a statistical technique, developed by the U.S. Navy for analyzing and quantifying uncertainties in sequential or parallel activities essential for completing a project within certain parameters. It focuses management attention on points that require remedial action or tradeoff in time (or other resources) to meet a deadline. The PERT flowcharts picture the interdependence of all elements in a project and the branching of subsequent activities resulting from the completion of a prior step. This paper shows in detail the use of PERT charts in the establishment of Northern Virginia Community College in the brief time between the enabling legislation of October 1966 and the opening of the rental campus in September 1967. Separate charts demonstrate the use of the device in overall planning, acquiring furniture and equipment, organizing the library, and providing food and janitorial services.

70. Ryans, David G., and others. A computer-based laboratory for automation in school systems. Santa Monica, California: System Development Corporation, March 12, 1962. 20p. ED 020 684 MF $0.25 HC $1.10.

As the educator faces decisions about new technology, he needs practical research on which to base his decisions. A systems approach to research, rather than a piecemeal approach, is highly desirable. Such an approach could employ simulation techniques, which differ from contextual ones primarily in scope and control, and which can deal with a wide range of alternatives, decisions, and interpretations. Accordingly, the System Development Corporation has constructed CLASS, a computer-based laboratory for the study of automated school systems. It can provide automated instruction for individuals and groups, conventional instruction for groups, cumulative and immediate analysis of student performance with results displayed for the teacher in real time, and centralized data processing for administrative guidance and planning.

71. Schalock, H. Del, and Hale, James R. (Eds.). A competency based, field centered, systems approach to elementary teacher education, volume 1: Overview and specifications. Final report. Portland: Northwest Regional Educational Laboratory, October 1968. 151p. ED 026 305 MF $0.75 HC $7.65.

This main volume explains the ComField (competency based, field centered) Model--a systems approach to the education of elementary school teachers that entails specifications (1) for instruction and (2) for management of the instructional program. In an overview, the ComField Model is described as a process; the conceptual frameworks on which it is based are detailed; and specifications for instruction and management are outlined. Part one provides specifications for the instructional program in terms of (1) entry behaviors, (2) instructional competencies (three phases include foundations, laboratory, and practicum),

(3) noninstructional competencies, (4) facilitating competencies, and (5) the personalization of professional competencies. Part two details specifications for program management, including explanations of the nature of the management system--instruction, policy, adaptation, program execution, supply personnel, research and development, costing, information transmission, and evaluation. Factors involved in implementing a ComField based program, including commitment, resources, adaptability, and time, are considered in part three.

72. Scribner, Jay D. A systems analysis of school board action. Paper presented at the American Educational Research Association--Chicago, February 17, 1966. 12p. ED 010 911 MF $0.25 HC $0.70.

The basic assumption of the functional-systems theory is that structures fulfill functions in systems and that subsystems operate separately within any type of structure. Relying mainly on Gabriel Almond's paradigm, the author attempts to determine the usefulness of the functional-systems theory in conducting empirical research of school boards. All school boards have four universal qualities--equilibrium, interdependence, comprehensiveness, and boundary. Demands and supports (inputs) reflecting the wants and desires of concerned individuals are made to the school board. The acceptance or rejection of an input at a school board meeting is determined by communication. The political functions of rule making, application, and adjudication complete the conversion process, and outputs (policy determination) result. By using content analysis to test the applicability of the systems approach to school board research, the author finds that extractive demands are more prevalent, and output totals correspond closely with input totals. Although some concepts are unverified, the functional-systems approach seems to improve researchers' understanding of the school board function.

73. Silvern, Leonard C. Systems analysis and synthesis applied to occupational instruction in secondary schools. Los Angeles: Education and Training Consultants Company. 106p. ED 015 676 MF $0.50 HC $5.40.

The goal of this study was to determine the feasibility of developing a model to describe "real-life" feedback signal paths from outside the secondary school or school district to an occupational teacher. After a review and evaluation of the literature in systems analysis and synthesis since 1914, it was concluded that attention should be directed to systems theory in disciplines other than education. Data used to synthesize a flowchart model were collected in interviews with educators, occupational directors, students, and other professionals, but the total number of interviews is not reported. The cybernetic model includes 49 closed-loop feedback signal paths, each identifiable in terms of five characteristics that in turn affect instructor performance. The model was shown to be feasible

and applicable to real-life. Continuing refinement of the loops, using mathematical techniques and real-life experiences, is recommended.

74. Sisson, Roger L. Applying operational analysis to urban educational systems, a working paper. Philadelphia: Management Science Center, Pennsylvania University, January 6, 1967. 34p. ED 012 097 MF $0.25 HC $1.80.

Operations research concepts are potentially useful for study of such large urban school district problems as information flow, physical structure of the district, administrative decision making, board policy functions, and the budget structure. Operational analysis requires (1) identification of the system under study; (2) identification of subsystems, processes, flows, and decisions; (3) development of a simulation model including behavioral and performance subsystems; (4) validation of the model; and (5) use of the model to explore such system characteristics as management control, allocation of resources, and decision flow.

75. Smith, Robert G., Jr. The design of instructional systems. Alexandria, Virginia: George Washington University, November 1966. ED 014 135 Not available from EDRS. (Available from Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151, AD 644 054, MF $0.65 HC $3.00.)

A systems approach to designing training is described and discussed, and factors bearing on training effectiveness are considered. An efficient instructional system is one in which the components form an integrated whole to achieve maximum effectiveness with the lowest cost. System components include presentation media, student management, techniques for practicing knowledge and performance, knowledge of results, directing student activities toward the training program goals, and testing and evaluating the system in terms of efficiency and cost.

76. Stedman, James M., and Serrano, Alberto C. A "systems" approach to the "school underachiever". Bexar County Community Guidance Center. 13p. ED 020 545 MF $0.25 HC $0.75.

Using a conceptual model drawn from systems-oriented thinking and research in developmental psychology, a limited number of school underachievement problems were analyzed. School underachievers are viewed as biological systems transacting with a variety of social systems. Therefore, the focus is on finding problem-producing elements in the total system. Since interaction with a social system is best understood in its developmental context, the underachiever's behavior is studied in two ways: (1) As it reflects his developmental levels, and (2) as it reflects developmental levels of interacting environmental systems. Cases

representing possible types of underachievement are presented. These cases demonstrate a systems and developmental approach in the solution. Recommendations are based on an analysis of the system in which culturally disadvantaged children live, and the developmental deficits produced. Changes are needed within the school, for it is the system designated to cope with these problems.

77. Stoller, David S. Report on the Organization for Economic Cooperation and Development's symposium on the application of operations analysis to educational problems. (Oslo, September 28-30, 1966). Washington, D.C.: National Center for Educational Statistics, October 1966. 7p. ED 013 219 MF $0.25 HC $0.45.

Proceedings from a 1966 conference of the Organization for Economic Cooperation and Development on the use of systems analysis in education are reported. Participants from Europe and the United States considered the application of quantitative methods and technological developments to educational problems. They agreed that (1) the techniques have potential contributions to educational innovation and change, both for the direct measurement of learning progress and for the overall analysis of the educational system; (2) the establishment of educational research and development pilot projects with the operations analysis approach should be investigated; and (3) the Organization for Economic Cooperation and Development should keep all member countries informed of developments for later review. Topics for discussion during a proposed 1967 conference are listed.

78. Stolurow, Lawrence M. Computer-based instruction: Psychological aspects and systems conception of instruction. Cambridge: Graduate School of Education, Harvard University, December 1967. 30p. ED 024 267 Not available from EDRS. (Available from Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151; AD 669 287, MF $0.65 HC $3.00.)

A computer-based instructional (CBI) system was developed following a conceptualization of the teaching-learning process and was used to conduct research relating to an idiographic model of tutorial instruction and to investigate basic variables in learning and transfer. To adapt teaching models to individual learners, the CBI system (acroynm: SOCRATES) stores a learner's responses, aptitude, achievement, and personality measures in addition to minimum final proficiency level required and maximum available time. The pretutorial decision is a strategy fitted to the individual that meets stated teaching objectives. The program decision adjusts teaching strategies to response characteristics demonstrated by a learner. Applying SOCRATES to hierarchical concept teaching, it was found that a required mastery of each part in

sequence does not have a facilitation effect on concept acquisition when an opportunity to review is available. The introduction of social reinforcers in SOCRATES' program was shown to have a positive effect on learning particularly when fitted to personality variables of a learner. SOCRATES also functioned as a cross-cultural sensitizer through instruction in semantic and behavioral differentials and as an AUTHOR program, developing instructional material for an exemplary learner with a reading disability.

79. Taft, Martin I., and Reisman, Arnold. The educational institution as a system--a proposed generalized procedure for analysis. 47p. ED 012 105 MF $0.25 HC $2.45.

A unified approach to the analysis and synthesis of functions and operations in educational institutions is presented. Systems analysis techniques used in other areas such as CRAFT, PERT, CERBS, and operations research are suggested as potentially adaptable for use in higher education. The major objective of a school is to allocate available resources in such a way as to maximize the difference in potential between entering and leaving students. This objective is used in developing such generalized systems as curriculum. Two orientations are used in generalized systems: (1) Control volume analysis (analysis of the inputs and outputs to and from a fixed volume of space) and (2) control mass analysis (following the progress of a particular student through the educational institution). Choice of orientation depends on the type of student under study, the level of aggregation, and the questions to be answered. This systems approach implies the following statements: (1) The intrasystem relationships and the interrelationships between the system and its environment are potentially manageable, understandable, and controllable; (2) the university can evaluate the effect of particular proposals on everything else that takes place in the university; (3) administrative or faculty decisions can be tested quickly and efficiently; (4) areas in need of research can be identified; (5) subsystems can be readily handled; (6) existing and expanding systems can be redesigned; (7) disciplinary boundaries tend to break down, and communication tends to increase; and (8) an adaptive mechanism is provided that moves the real system toward improvement.

80. Taft, Martin I. Recent and potential application of engineering tools to educational research. Paper presented at the first presession of the Wisconsin Educational Research Association--Manitowoc, Wisconsin, December 1, 1967. 17p. ED 022 258 MF $0.25 HC $0.95.

This paper presents a summary of some recent engineering research in education and identifies some research areas with high payoff potential. The underlying assumption is that a school is a system with a set of subsystems that is potentially susceptible to analysis, design, and eventually some sort of optimization. This assumption leads to the

increased application of engineering techniques that relate inputs and outputs, computer programing, simulation vehicles, control and decision theory, and many other tools to the solution of administrative and teaching problems in education. Some areas dealt with are school management, resource allocation problems, decision rules, curriculum content transmission, and curriculum content allocation.

81. Talmage, Harriet. An experimental study in curriculum engineering. Paper presented at the American Educational Research Association conference--Chicago, Illinois, February 8-10, 1968. 16p. ED 020 581 MF $0.25 HC $0.90.

    To test the application of the general systems approach in curriculum development, a problem was proposed identifying the phenomena and contingent variables of the curriculum system within the input-output framework. With teachers, school administrators, and graduate students of education as volunteer participants, two experimental groups given inservice training and one control group without inservice training yielded data primarily by evaluation of written curricula, verbal content analysis, and interaction process analysis. Findings generally supported the experiment's main hypothesis that initial curriculum engineering decisions on selected data will significantly facilitate group decision making in curriculum development.

82. Terrey, John N. Program budgeting and other newer management tools in higher education: A description and annotated bibliography. Seattle: Center for Development of Community College Education, University of Washington, June 1968. 62p. ED 024 144 MF $0.50 HC $3.20.

    The first part of this document describes the following four new managerial tools available to the educational administrator: Planning-programing-budgeting, systems analysis, PERT or the critical path method, and the Delphi technique, which employs the systematic solicitation and collection of expert opinion to achieve consensus in the formulation of goals. The second part is an annotated bibliography that lists 73 books, reports, journal articles, bibliographies, and government publications related to the decision-making process, published between 1963 and 1968.

83. Tracz, George S. An overview of optimal control theory applied to educational planning. Paper presented at the annual meeting of the American Educational Research Association--Los Angeles, California, February 5-8, 1969. 10p. ED 030 189 MF $0.25 HC $0.60.

    Mathematical model building for educational planning in this country has been heavily influenced by the USOE DYNAMOD Model, a computerized Markov-type or input-output model. However, the input-output method is

structurally inadequate to reflect the true behavior of the educational system. To introduce some elements of decision making into the model, some investigators have attempted to apply optimal control theory. Application of optimal control theory involves the addition of control variables, which are constrained in their values and thus reflect political or policy limits, to a general mathematical model consisting of equations defining the interdependence of sets of variables characterizing the educational system. Control theory models are theoretically attractive planning devices because they allow for the specification of a system's initial states and certain desired targets while providing for the selection of a policy that achieves these targets at a minimum cost while satisfying existing constraints. Although barriers to practical implementation exist, this approach promises to aid in revealing the values of a systems approach to social and economic problems.

84. University of Iowa. The educational program--coordination and development; Iowa Community College workshop (University of Iowa, Iowa City, June 12-16, 1967). 53p. ED 014 300 MF $0.25 HC $2.75.

This workshop on the coordination and development of the educational program presented material of interest to personnel of both new and established colleges. Four approaches were discussed in detail: (1) The use of a core program to provide a common experience for all students before they decide between an occupational course or higher level preparation, (2) the employment of a consultant in early planning stages and the related use of surveys in the development of the instructional program, (3) an examination of possible uses of electronic data processing for routine data collection and dissemination tasks, and (4) a systems approach to the instructional program, with the analysis of the course to define objectives, the framing and sequencing of the instructional modules, and the evaluation of the learner's response in accordance with the specified goals. It was emphasized that it is this response produced by the system that is important, not the system itself.

85. Werts, Charles E. The study of college environments using path analysis. Evanston, Illinois: National Merit Scholarship Corporation, 1967. 43p. ED 016 301 MF $0.25 HC $2.25.

This study attempts to demonstrate that path analysis is a valuable tool for interpreting correlations in a causal sense. Path analysis is applied to a nonexperimental, panel survey in an effort to determine whether the more selective or less selective colleges had a differential impact on the educational plans of their students. The problem is to interpret three correlations--selectivity with changes in educational plans, selectivity with college grades, and college grades with changes in educational plans.

Data for the study were obtained from 127,125 entering 1961 freshmen in 248 4-year colleges and universities. The general procedure was to construct six equations using seven variables--father's education, National Merit Scholarship test score, high school grade average, freshman educational plans, selectivity of college attended, freshman year college grades, and sophomore educational plans. The results suggest that changes in educational plans are a positive function of the degree to which a student's academic performance differs from that predicted from his background and the college he attends and that the direct influence of college selectivity on educational plans appears to be small or nonexistent. It is concluded that it is extremely difficult to put theories about college environments into testable form.

86. Wiens, Jacob H. Systems approach to learning. November 16, 1966. 29p. ED 012 182 MF $0.25 HC $1.55.

To permit comparative analysis for purposes of educational planning at San Mateo, five institutions with systems programs are evaluated on the basis of trip notes. Oakland Community College has been completely organized around the voluntary work-study laboratory approach to learning. Oral Roberts University, Oklahoma Christian College, Henry Ford Community College, and Mt. San Jacinto College have adapted new programs to existing facilities and curriculum. The introduction of programed instructional media has been accompanied by the addition of audiovisual equipment and study carrels. (This equipment is described and compared). Limitations on facilities and budget at San Mateo preclude the introduction of carrels, but modification of the Mt. San Jacinto program appears feasible in terms of translation and cost. Student-faculty ratios and faculty orientation techniques are also important aspects of planning. An appendix contains descriptive material on the instructional method used at Oakland College.

87. Williams, Gareth L. Towards a national educational planning model. Paper presented for the Symposium on Operations Analysis of Education--Washington, D.C., November 19-22, 1967. 18p. ED 021 311 MF $0.25 HC $1.00.

This paper discusses educational planning activities in which the Organization for Economic Cooperation and Development (OECD) has had some involvement. Only a part of these activities are dealt with--national educational planning within the context of economic and social development. An attempt is made to show how OECD's work in educational planning has led almost inevitably to the adoption of a "systems approach." Emphasis is placed on the relative merits of the "manpower" approach and the "social demand" approach to educational planning, and on how these two approaches have not been about educational planning as

such, but about different criteria for establishing the objectives or goals of the educational system. An example is given of a model of the dynamic structure of the educational system in terms of student flow.

88. Yett, Frank A. Resource allocation processor for the school simulation vehicle pilot version. Santa Monica, California: System Development Corporation, January 23, 1964. 31p. ED 010 578 MF $0.25 HC $1.65.

A description was presented of a simulation vehicle that was being developed to permit modeling any school configuration. The model was considered as having two major parts: (1) The activity processor and (2) the resource allocation processor. The addition of the resource allocation processor to the previously developed simulation vehicle provides for (1) the logical flow and (2) the capability for control of resources (persons, places, and things) by analyzing the termination, continuation, and activation of activities according to the logical demands of the situation vehicle and the current expression of the systems resource capabilities. Flowcharts of the resource allocation processor are included.

89. Yoho, Lewis W. The "orchestrated system" approach to industrial education (industrial arts--technical--vocational). Terre Haute: Indiana State University, 1967. 46p. ED 020 317 MF $0.25 HC $2.40.

This systems approach determines and identifies ultimate educational goals and intermediate goals that provide the operational dynamics for goal attainment. The approach uses models designed by the systems network analysis process, or snap maps which are simplified flowcharts, exposing tentative social and industrial elements of the industrial arts curriculum. This process is in contrast to the usual practice of factoring out elements of industry such as trades, concepts, or sample experiences. The ultimate goal of education ("the good life") and intermediate goals, or educational curriculum areas, are diagramed to show their purpose and place from their position and relationship in the model. "Education for developing competencies in communications" is designed into the industrial arts model as the key goal gradient. When these competencies are developed, the student may begin parallel development of other goal gradients, each of which may be subjected to the systems modeling technique in continued subanalysis, each revealing more specific content. The theory of teaching and learning for this systems approach is based on developing individual self-motivation and self-discipline and on creating a "whole" which the student must synthesize and relate into an understanding of the "whole." Thirty-nine charts and snap maps illustrate the progressive subanalysis of the industrial education curriculum elements and the concepts of educational planning presented.

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